

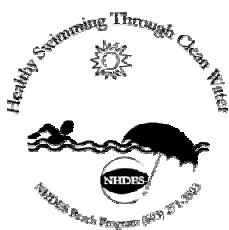
**Foss Beach, Rye**

**BEACH WATER QUALITY REPORT**

**SUMMER 2006**



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## BACKGROUND

The New Hampshire Department of Environmental Services (DES) has operated a Public Beach Inspection Program, or Beach Program, for over 20 years. An established coastal beach monitoring program began in 1989 and the program continues to provide monitoring on a weekly basis. DES recognizes the health threat at public beaches. As a result, increased beach monitoring and bacteria source tracking have been implemented to further protect public health.

Coastal beaches are monitored for the presence of the fecal bacteria *Enterococci*. These fecal bacteria are present in the intestines of warm-blooded animals including humans. Fecal bacteria, when present in high concentrations and ingested, can commonly cause gastrointestinal illnesses such as nausea, vomiting and diarrhea. They are also known as indicator organisms, meaning their presence in water may indicate the presence of other potentially pathogenic organisms.

In October of 2000, the United States Environmental Protection Agency (EPA) signed into law the Beaches Environmental Assessment and Coastal Health (BEACH) Act. The BEACH Act is an amendment to the Clean Water Act, which authorizes the EPA to award grants to eligible states. The purpose of the BEACH Act is to reduce the risk of disease to users of the nation's recreational waters. BEACH Act grants provide support for development and implementation of monitoring and notification programs that help protect the public from exposure to pathogenic microorganisms in coastal recreation waters.

DES received grant funding in 2002 to develop and implement a beach monitoring and notification program consistent with EPA's performance criteria requirements published in the *National Beach Guidance and Required Performance Criteria for Grants* document ([www.epa.gov/waterscience/beaches/grants](http://www.epa.gov/waterscience/beaches/grants)). DES has successfully met all requirements and continues to expand the monitoring and notification program. In 2002, only nine coastal beaches were monitored, while in 2003 and 2004, 15 and 16 beaches respectively, were monitored on a routine basis. Fifteen beaches were sampled again in 2005 and 2006. In 2004, volunteers sampled Star Island beach, but circumstances did not allow for this cooperative effort in 2005 and 2006.

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## Beach Description

Foss Beach has a rocky base at high tide but a fine sand substrate exposed at low tide. The beach has a total length of 3,750 feet. The beach is frequently used by residents and vacationers for recreational activities. There are 7 access points to the beach area from the roadside parking along Route 1A (Figure 1). Lifeguards are not present and sanitary facilities are unavailable.

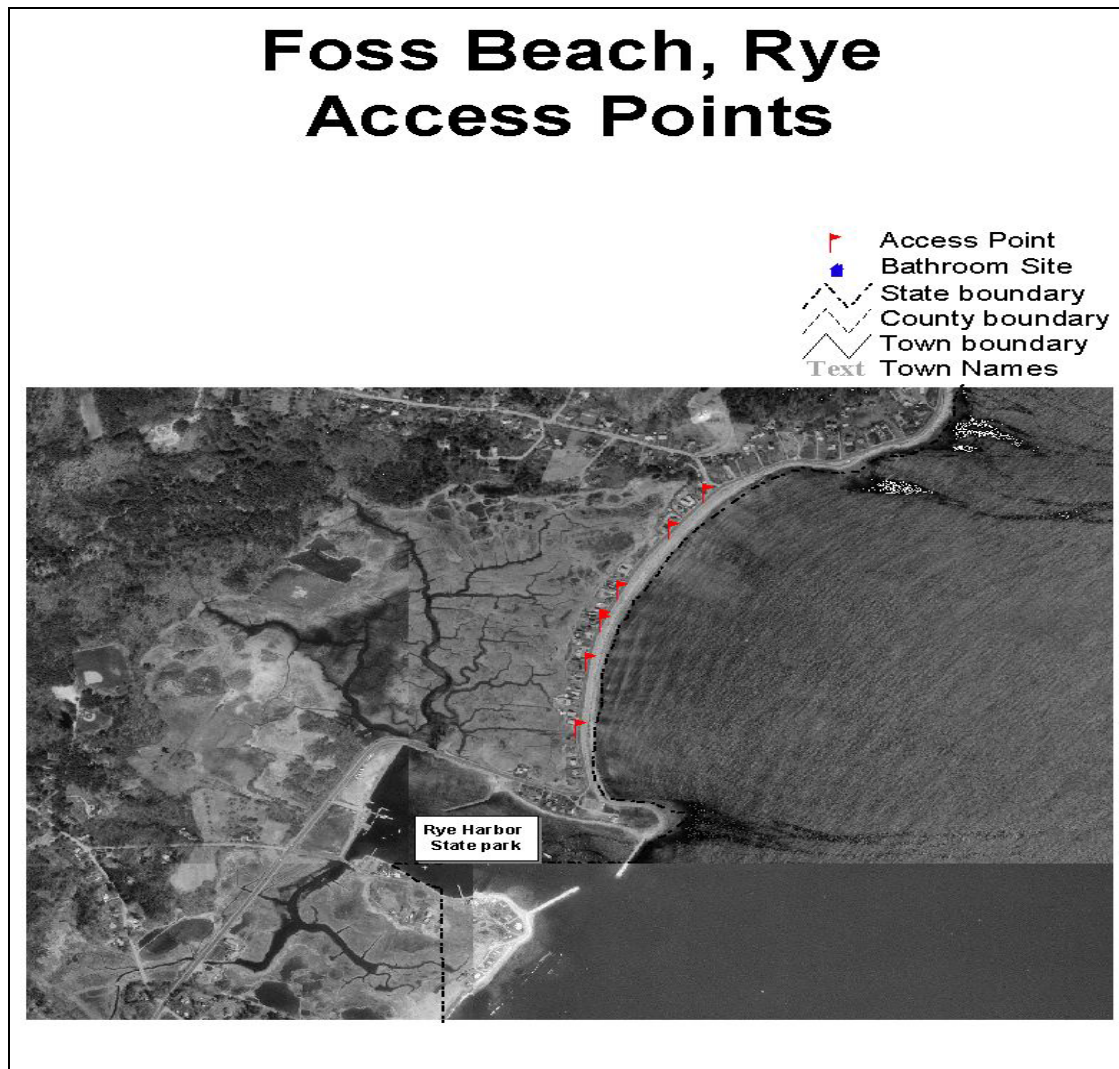


Figure 1. Foss Beach Access Points.

Animals are not frequently observed on the beach. Gulls were observed on one occasion this summer while dogs were observed on three separate occasions. The town of Rye does prohibit dogs on public beaches during regular beach hours. Enforcement of the dog ordinance should be a priority to help keep the state's beaches free of bacterial contamination created by pet waste and safe for recreational activities.

Below is a brief description of the sampling stations at Foss Beach, Rye. The stations are pictured in Figure 2.

**Table 1. Station Descriptions**

<b>Description</b>	<b>Latitude</b>	<b>Longitude</b>
<b>Left sample station:</b> at the northern end of the beach off of Route 1A across from Washington Street. The sample is collected straight down from the rocky beach access ramp.	43° 0' 38.6911"	-70° 44' 28.0522"
<b>Center sample station:</b> in front of the dark grey house with a white porch and flagpole off of Route 1A. The sample is collected straight down from the wooden beach access ramp.	43° 0' 25.498"	-70° 44' 39.4459"
<b>Right sample station:</b> collected straight down from the first rocky beach access ramp at the southern end of the beach off of Route 1A. The ramp is located before Ray's Seafood Restaurant.	43° 0' 15.0114"	-70° 44' 42.0768"



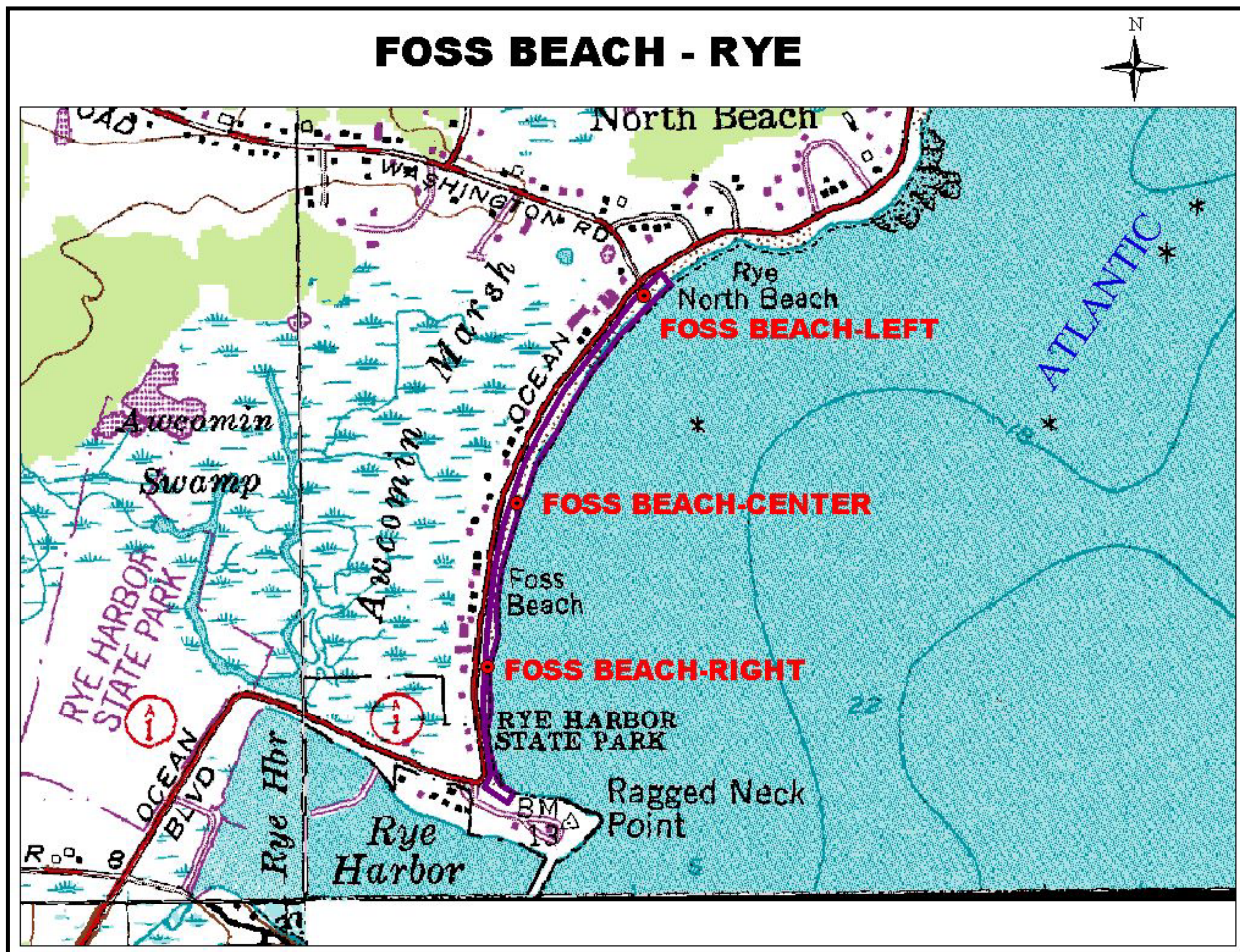


Figure 2. Map of Foss Beach

### Tier Status and Sampling Frequency

The Beach Program developed a risk-based beach evaluation process and tiered monitoring approach and implemented this approach during the 2003 beach season. Beach evaluations are conducted annually to determine potential public health threats. Evaluations are based on several criteria in three main categories: beach history, microbial pathogen sources, and beach use. The evaluations for the 2006 season included a new criterion to assess beaches. Beaches are now assessed as impaired for bacteria. Impairments are based the most recent version of the Consolidated Assessment and Listing Methodology (CALM) submitted to EPA by DES every two years. The CALM assesses beach units as impaired based on historical exceedances of both the single sample and geometric mean bacteria standards.

Based on these criteria, beaches were assigned a Tier I-Impaired, Tier I or Tier II status in 2006. Tier I-Impaired beaches are high priority and have an increased potential to affect public health, Tier I are medium priority, while Tier II are low priority beaches that have less potential to affect

public health. Beach sample frequency is based on the Tier statuses; Tier I-Impaired beaches were sampled twice per week, Tier I beaches were sampled once per week, and Tier II beaches were sampled once every other week in 2006.

Foss Beach is a Tier II beach. It was categorized as a Tier II beach based on the Beach Program's Risk-Based Evaluation ranking system. This ranking indicates that there is infrequent use of this beach, as compared to other coastal beaches. The beach ranking has not changed since the system was implemented in 2002. Because Foss Beach is a Tier II beach, it is sampled once every other week.

## **Water Quality**

Beaches are monitored to ensure compliance with State Water Quality Standards. Marine waters are analyzed for the presence of the fecal bacteria Enterococci. Enterococci are known as indicator organisms, meaning their presence may indicate the presence of other pathogenic organisms. The state standard for Enterococci at public beaches is 104 counts/100 mL in one sample, or a geometric mean of 35 counts/100 mL in three samples collected over 60 days. Standard exceedances require the issuance and posting of a beach advisory. Beach advisories remain in effect until subsequent beach sampling indicates safe water quality conditions.

The number of samples collected at each beach is a function of beach length. Beaches less than 100 feet in length are sampled at left and right locations 1/3 of the distance from either end of the beach. Beaches greater than 100 feet in length are bracketed into thirds and sampled at left, center and right locations. Routine sample collection may be enhanced by sampling known or suspected pollution sources to the beach area. Storm event sampling may be conducted at beaches where wet-weather events are expected to affect beach water quality.

This summer's weather can best be described as unpredictable. The 2006 sampling season began May 30. During the month of May, New Hampshire experienced flood conditions typical of a 100-year flood, while the months of June and July were wetter and warmer than normal, and August was unseasonably cool and dry. May had over 17 inches of rain setting a record high for the month, and over eight inches of rain fell during June (as recorded at Pease International Tradeport, Portsmouth, N.H.). Precipitation was recorded on 34 days of the 95 day sampling season. Twenty-two beach days (beach hours 9:00a.m. to 5:00p.m.) were directly affected by precipitation. At Foss Beach, there were a total of 7 routine inspections performed and 21 samples collected in 2006.

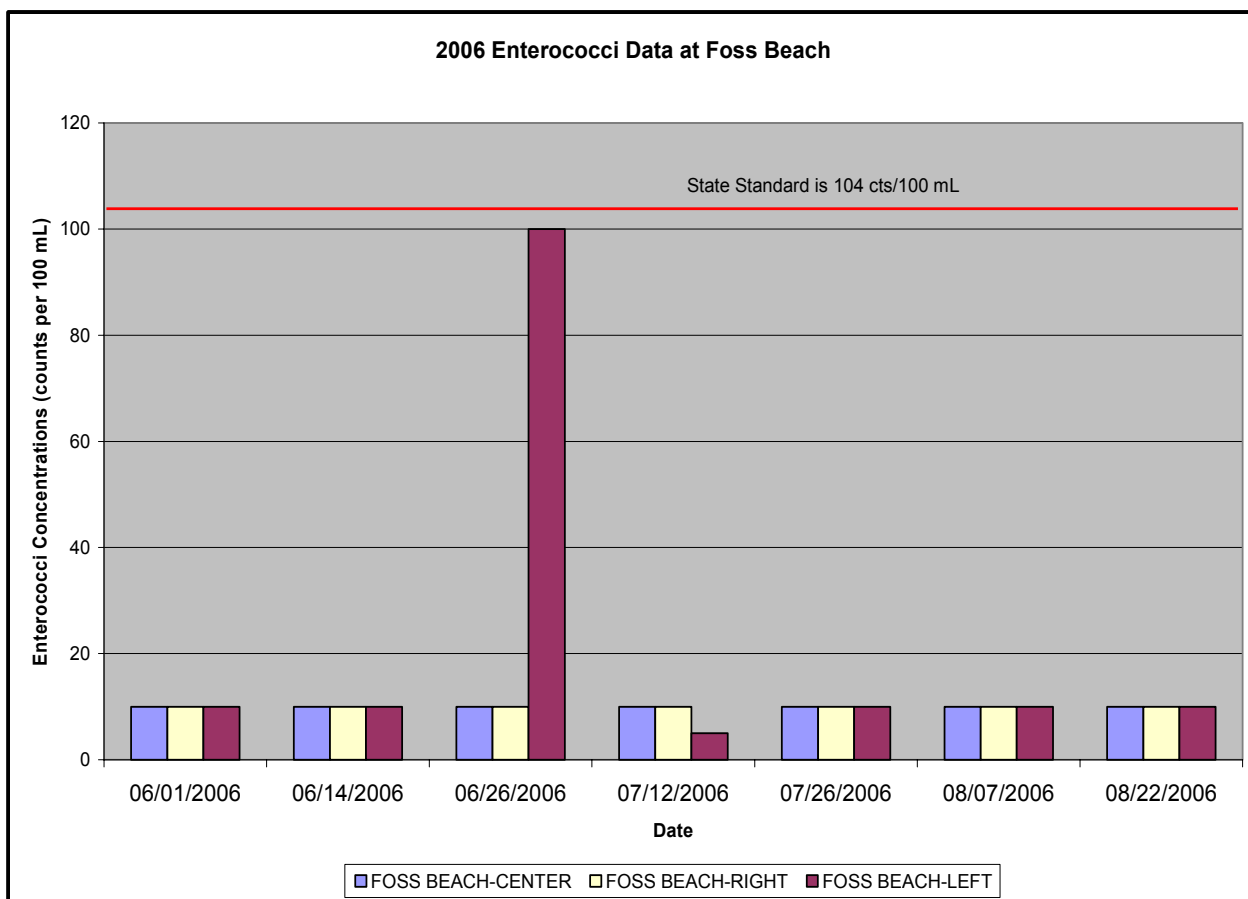
Table 2 includes the Enterococci data from each sampling event in 2006. Overall, the summer 2006 Enterococci levels were very low and within the state's standards for public beaches. Enterococci levels at the left sample station were elevated on June 26th but the Enterococci level dropped to within the state standards for designated beaches when sampled on July 12 (Figure 3). There were no advisories issued for this beach in 2006.

**Table 2. Foss Beach Enterococci Data 2006**

<b>Date Sampled</b>	<b>Station Name</b>	<b>Enterococci Results (counts per 100 mL)</b>
6/1/2006	Left	10
	Center	10
	Right	10
6/14/2006	Left	10
	Center	10
	Right	10
6/26/2006	Left	100
	Center	10
	Right	10
7/12/2006	Left	5
	Center	10
	Right	10
7/26/2006	Left	10
	Center	10
	Right	10
8/7/2006	Left	10
	Center	10
	Right	10
8/22/2006	Left	10
	Center	10
	Right	10



Figure 3 depicts the relationship between Enterococci results and the state standards for coastal beaches.



**Figure 3. Foss Beach Enterococci Data 2006**

### Areas of Concern

Dogs were observed on the beach. The town of Rye has an ordinance that prohibits beach access to dogs during regular beach hours. As long as people pick up dog wastes there is little concern, however the town should enforce the ordinance. Pet wastes are sources of bacteria to swimming areas and may increase the potential for beach advisories. Young children may contact feces when playing in the sand creating a potential health risk to them.

### Thoughts for the Future

- The beach management should install dog waste receptacles and bags to reduce the fecal contamination to the beach. If interested, please contact Alicia Carlson at (603) 271-0698 or [acarlson@des.state.nh.us](mailto:acarlson@des.state.nh.us). The Beach Program has funds available to supply towns with pet waste receptacles.

## **Appendix A**

### **Special Topic 2006**

## Rapid Assessment Methodology for the Detection of Microbiological Indicators

To assess beach water quality, the Department of Environmental Services (DES) monitors fecal indicator bacteria levels at coastal beaches on a routine basis. Unfortunately, results from sample analysis can take anywhere from 24 to 48 hours. Because it takes at least 24 hours to receive results, beach managers and the public are not informed of water quality problems until after the public may have been exposed. This is an issue facing beach officials throughout the world, and is a priority of the US



Environmental Protection Agency (EPA). The EPA, universities and private entities are researching rapid assessment methods to enumerate bacteria and viruses. These methods will allow beach officials to post advisories on the same day water quality is impaired, thus, better protecting public health. There are three different rapid assessment method technologies available: Molecular surface recognition, nucleic acid detection and enzyme/substrate based methods. All rapid assessment methods will take less than two hours to obtain results.

Molecular surface recognition methods capture and/or label the target bacterium by binding to molecular structures on the exterior surface or in its genetic material. Analyses of coastal beach water samples currently employ culture-based methods for the detection of Enterococci bacteria, an indicator for fecal pollution in marine water. The quickest culture-based method takes up to 24 hours to provide results. Now, a new method is being developed to enumerate Enterococci. This new method uses Transcription-Mediated Amplification (TMA) with a fluorescently-labeled probe to amplify a specific region of Enterococci ribosomal RNA (rRNA).

The TMA rapid assessment method is currently being tested in Southern California. Method development is moving quickly and will likely come to execution within five years. Method cost is a significant reason the new technology is not currently employed. Once this procedure is widely and routinely accepted, the expenses should lower. This rapid assessment method is very beneficial as it will allow beach managers to take immediate action towards protecting the public from waterborne pathogen exposure on the same day water is sampled.

Another rapid assessment method being developed for fecal indicator detection is Quantitative Polymerase Chain Reaction (QPCR). QPCR is a nucleic acid detection method that targets genetic material of bacteria, viruses or protozoan indicators. QPCR is used to test for both *E. coli* and Enterococci. Results can be obtained from this method on an average of two hours after sampling. This method has demonstrated 85-90 percent agreement with existing routine methods. QPCR can be used to detect other water quality indicators such as *Bacteroides thetaiotamicron* and human enterovirus. Studies indicate that ratios of *B. thetaiotamicron* may provide useful information as to fecal contamination sources.

The final rapid assessment technology methods available are the enzyme/substrate based methods. These methods pair chromogenic or fluorogenic substrate methods already widely used with advanced optical or electrical detectors. These methods are directed at reducing the incubation periods of current membrane filtration methods. Some of these methods measure excitation and absorbance of the fluorescent metabolite of Enterococci using a fluorometer to speed the detection rate. A popular type of enzyme/substrate method is the Dual-Wavelength Fluorimetry (DWF).

These rapid assessments methods are currently being tested for accuracy, sensitivity and efficiency. Research indicates that these new methods will be made available within the next five years. Once these technologies are made available and laboratories adopt the methods, beach management will have a new tool to better protect public health. With assistance from EPA Beach Grants, New Hampshire will be proactive in employing accepted methods.